

Event Data Recorder (EDR) Research History

Event Data Recorders (EDRs) have been used for many years to record crash related measurements, including the crash deceleration of a vehicle. Early efforts conducted by National Highway Traffic Safety Administration (NHTSA) incorporated a device, circa 1970s, which used analog signal processing and recording devices to analyze and store the crash data. In 1974, The NHTSA Disc Recorder Project equipped 1000 vehicles in several fleets that totaled 26 million miles. Twenty six crashes were analyzed, measuring delta-Vs up to 20 mph. Actual deceleration-time histories were collected. During the same year, General Motors (GM) introduced the first regular production driver/passenger airbag systems in selected vehicles. These units contained a data recording feature for deploying air bags in severe crashes.

In 1975, the Office of Technology Assessment (OTA) Washington, DC, a Congressional agency issued a final report titled Automobile Collision Data: An Assessment of Needs and Methods of Acquisition. The study was requested as an evaluation of the automotive crash recorder program sponsored by NHTSA. The final report covered these areas: 1. The need for more and better crash data. 2. Characteristics of an adequate data collection program. 3. Alternatives for an adequate data collection program. 4. Federal responsibility and expenditures for collision data gathering.

In 1976, General Motors (GM) introduced SDM (Sensing & Diagnostic Module) technologies on a limited number of vehicles. By 1990, General Motors (GM) added DERM (Diagnostic and Energy Reserve Module) technologies to record closure times for both the arming and discriminating sensors as well as any fault codes present at the time of deployment of the

air bag. During the early 1990's, General Motors (GM) installed sophisticated crash data recorders on 70 Indy Formula One race cars.

In 1992, the European Union Drive Project II 2007 SAMOVAR (Safety Assessment Monitoring on Vehicle with Automatic Recording) research program in the United Kindgom, The Netherlands and Belgium involved 850 vehicles for a 12 month period with results indicating that EDRs reduced the accident rate by 28 percent and costs by 40 percent.

In 1994, The Johns Hopkins University Applied Physics Laboratory issued a final report titled Technology Alternatives for an Automated Collision Notification System (DOT HS 808 288) demonstrating the potential of Accident Crash Notification (ACN) technologies. ACN is technology that will provide faster and smarter Emergency Medical Services (EMS) response in an attempt to save lives and reduce disabilities from injuries. Although ACN and EDR technologies are not directly related, they share common aspects.

In 1996, the NHTSA Special Crash Investigation (SCI) program began collecting crash data to support crash investigations activities. Most of these early cases were low speed air bag related fatalities that could not be accurately reconstructed by the current algorithm.

In 1997, The National Transportation Safety Board (NTSB) issued Safety Recommendation H-97-18 to NHTSA to "pursue crash information gathering using EDRs."

<p><u>H-97-18 (NHTSA)</u> Develop and implement, in conjunction with the domestic and international automobile manufacturers, a plan to gather better information on crash pulses and other crash parameters in actual crashes, utilizing current or augmented crash sensing and recording devices. (Source -- Letter of recommendation issued as a result of a Safety Board 1997 public forum on air bags and child passenger safety.)</p>

In April 1997, the National Aeronautics Space Administration (NASA) Jet Propulsion Laboratory (JPL) report investigating air bags recommended that NHTSA “study the feasibility of installing and obtaining crash data for safety analyses from crash recorders on vehicles.”

In April 1998, the 16th Motor Vehicle Research Advisory Committee (MVSRAAC) recommended forming a NHTSA Research & Development Event Data Recorder (EDR) Working Group (WG).

In May 1998, the 16th International Technical Conference on the Enhanced Safety of Vehicles (ESV) was held at Windsor, Ontario, Canada, May 31 to June 4. Several papers were specially on emerging EDR technologies.

In October 1998, the initial meeting of the NHTSA Event Data Recorder (EDR) Working Group was conducted on October 2 at Washington, DC. The first meeting had several objectives: 1. Understand the status of EDR technology. 2. Understand the needs for crash data 3. Review the privacy issues. 4. Develop the working group. During this meeting members of the WG spoke about EDRs. NHTSA R&D presented operating rules for a MVSRAAC working group, which included the public documentation process, a background presentation of EDRs, and a short discussion on privacy. A detailed data list was circulated for consideration.

In November 1998, the NHTSA Office of Safety Performance Standards (NPS) received a petition for rulemaking which requested the government to require Event Data Recorder (EDR) technology on all new vehicles. This petition was denied because of on-going initiatives.

In February 1999, the second NHTSA Event Data Recorder (EDR) Working Group meeting was held on February 17 at Washington, DC. The second meeting’s objectives were: 1. Refine working group objectives. 2. Review WG members’ input for data elements. 3. Review of WG’s privacy

issue policy papers. 4. Other discussions regarding systems & data. A set of objectives was developed by the WG. Manufacturers, the government, and others presented short papers regarding their individual company's privacy policies. The WG also continued its effort to quantify data elements, including selecting a set of "Top-Ten" data elements which should be considered when developing a new EDR. Presentations included: EDR Validation, NHTSA Research in Vehicle Crash Speed and Loss Management System's Eye Witness EDR.

In May 1999, the National Transportation Safety Board (NTSB) held an *"International Symposium on Transportation Recorders"*, May 3-5, at Arlington, Virginia. The objective was to share knowledge and experience gained from the use of recorded information to improve transportation safety and efficiency.

In June 1999, the NHTSA Office of Safety Performance Standards (NPS) received a second petition for rulemaking which requested the government to require EDR technology on all new vehicles. This petition was again denied.

In June 1999, the third NHTSA Event Data Recorder (EDR) Working Group meeting was held on June 9 at Washington, DC. The third meeting's objectives were: 1. Review of the working group objectives. 2. Review WG members' input for data elements. 3. Review of WG's privacy issue policy papers. During this meeting, the WG continued to refine its position on data elements and privacy issues. Presentations included: Information regarding an upcoming NTSB symposium on data recorders, Automatic Collision Notification, recent activities in ISO related to EDRs, and current and recent activities at Ford regarding EDRs.

In October of 1999, the fourth NHTSA Event Data Recorder (EDR) Working Group meeting was held on October 6 at Washington, DC. The fourth meeting's objectives were: 1. Discuss insurance company issues 2.

Continue to learn about EDR systems. 3. Hold two group sessions – Data Elements, and Privacy and Legal Issues. The session on data elements reworked the WG’s top 10 data elements list from individual to categories of data elements. The privacy and legal issues session discussed WG members concerns and company and government practices related to EDRs. Presentations included: the I-Witness EDR system, VDO North America, potential for EDR or EDR/ACN use in Massachusetts based on a study of fatal level crashes.

In November 1999, the NTSB issued Safety Recommendations H-99-45-54 to NHTSA:

H-99-53 (NHTSA) Require that all school buses and motor coaches manufactured after January 1, 2003, be equipped with on-board recording systems that record vehicle parameters, including, at a minimum, lateral acceleration, longitudinal acceleration, vertical acceleration, heading, vehicle speed, engine speed, driver’s seat belt status, braking input, steering input, gear selection, turn signal status (left/right), brake light status (on/off), Head/tail light status (on/off), passenger door status (open/closed), emergency door status (open/closed), hazard light status (on/off), brake system status (normal/warning), and flashing red light status (on/off) (school bus only). For those buses so equipped, the following should also be recorded: status of additional seat belts, airbag deployment criteria, airbag deployment time, and airbag deployment energy. The on-board recording system should record data at a sampling rate that is sufficient to define vehicle dynamics and should be capable of preserving data in the event of a vehicle crash or an electrical power loss. In addition, the on-board recording system should be mounted to the bus body, not the chassis, to ensure that the data necessary for defining bus body motion are recorded. (Source -- Special Investigation Report -- *Bus Crashworthiness Issue*, (NTSB/SIR-99/04).)

H-99-54 NHTSA. Develop and implement, in cooperation with other government agencies and industry, standards for on-board recording of bus crash data that address, at a minimum, parameters to be recorded, data sampling rates, duration of

recording, interface configurations, data storage format, incorporation of fleet management tools, fluid immersion survivability, impact shock survivability, crush and penetration survivability, fire survivability, independent power supply, and ability to accommodate future requirements and technological advances. (Source -- Special Investigation Report -- *Bus Crashworthiness Issue*, (NTSB/SIR-99/04).)

In February 2000, the fifth NHTSA Event Data Recorder (EDR) Working Group meeting was held on February 2 at Washington, DC. Meeting objectives included: 1. Review OEM EDR systems. 2. Group sessions – Status of EDR Technology, and Who Are the Customers. At this meeting, NHTSA announced that the MVSRAC had been terminated because the charter under which it operated had expired and that all activities within MVSRAC would need to be halted. Because the nature of the WG was that of fact finding, NHTSA R&D agreed to continue the WG efforts under a R&D-sponsored WG. Both group sessions discussed the two objectives and their outcomes were shared with the WG. Presentations included: OEM discussions of EDR technologies and a NHTSA demonstration of the Vetronix crash data retrieval device.

In March 2000, the Vetronix Corporation began selling its Crash Data Retrieval (CDR) system. The CDR system was the first and only device available to the public that allowed users to download data from the EDRs installed on passenger and light-duty vehicles.

In April 2000, the NTSB held a symposium titled *Transportation Safety & the Law*, April 25-26, at Crystal City, Virginia. The symposium focused on issues related to improving transportation safety and the use of available information in the 21st century. Some of the questions addressed included: How can the generation of data and information enhance transportation safety? What are the implications of government investigations and private litigation for information development? What is the proper governmental approach to encourage the availability of data for legitimate uses?

In June 2000, the sixth NHTSA Event Data Recorder (EDR) Working Group Meeting was held on June 7 at Washington, DC. The meeting included four group sessions: 1. How Should the Data be Collected and Stored? 2. How Should the Data be Retrieved? 3. Who Should be Responsible for Keeping the Permanent Record? 4. Demonstration of EDR Technology. Group sessions considered how different users affect collection and storage, and evidence and traceability issues, as well as the benefits related to collection and storage. Issues related to data retrieval from a vehicle EDR, including current systems, near future systems, and future needs, were discussed. Who was currently storing EDR data, and possibilities for storing data in the future were reviewed. Also discussed were electronic collection of EDR data and the need for central repositories. The final group session generated a list of possible EDR demonstration sources. Presentations included: Crash Data Collection using EDR Technology at Georgia Tech, Ford and NHTSA SCI on Advanced Restraint Program using EDRs, and an updated discussion on Manufacturer Data Elements.

In June 2000, the initial meeting of the NHTSA Truck & Bus Event Data Recorder (EDR) Working Group was held on June 8 at Linthicum, Maryland. The meeting included an explanation of the objectives, limitations of the NHTSA's role, emphasis of a fact finding mission, awareness that the WG cannot make recommendations to regulatory agencies, consent that the WG could compile information to provide input for future decisions. Additional materials circulated included the agenda, a technical brief on SafeTRAC from Assistware Technology, a draft Recommended Practice from the TMC, a paper on Crash Survivable Modules from Smiths Industries, a system schematic from LMS, a paper on Accident Reconstruction from Eaton VORAD Technologies and VORAD Safety System, Inc., and a system schematic from Traxis System Components.

In October 2000, the second NHTSA Truck & Bus Event Data Recorder (EDR) Working Group meeting was held on October 25 at Washington, DC.

This second meeting gave participants an opportunity to see an example of a NTSB accident analysis using EDR data, an overview of an available event recording product from VDO, and a presentation of crash statistics and types of crashes where EDRs may show benefit. There was also a discussion of numerous issues surrounding EDRs.

In February of 2001, the third NHTSA Truck & Bus Event Data Recorder (EDR) Working Group meeting was held on February 15-16 at Florida Atlantic University, Boca Rattan, Florida. The agenda items for this meeting included: Event Data Recorder (EDR) Issues and Recommendations paper presented by the Smiths Group, an update on current EDR technologies, status of EDR technology, the VDO crash recorder, emerging technologies and applications, Safety Intelligent Systems (SIS), and Solutions for a Dynamic Marketplace presentation by Insurance Services Office (ISO).

In June 2001, the 17th International Technical Conference on the Enhanced Safety of Vehicles (ESV), took place at Amsterdam, The Netherlands, June 4-7. There were several papers presented which were specific to EDR technologies.

In June 2001, the National Academy of Sciences (NAS), Transportation Research Board (TRB) / National Cooperative Highway Research Program (NCHRP) issued an Anticipated Project 17-24, FY 2002: Use of Event Data Recorder (EDR) Technology for Highway Crash Data Analysis.

In August 2001, the Event Data Recorder (EDR) Working Group Final Report (90-pages) was issued emphasizing that “Event Data Recorders (EDRs) offer great potential of improving vehicle and highway safety.”

The NHTSA Truck & Bus Event Data Recorder (EDR) Working Group is scheduled to meet on October 26, 2001 at Georgia Technical Institute, Atlanta, Georgia.